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| 10/810,784 | 03/26/2004 | Hung Chih Chen | 008698 / 556001 | 9643 |

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EXAMINER

MACARTHUR, SYLVIA

ART UNIT PAPER NUMBER

1763

DATE MAILED: 03/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/810,784

Applicant(s)

CHEN ET AL.

Examiner

Sylvia R. MacArthur

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 29 and 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>8/19/2004, 3/22/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-28, drawn to a carrier head for CMP, classified in class 156, subclass 345.12.
 - II. Claims 29 and 30, drawn to a method for polishing, classified in class 216, subclass 88.
2. Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the process can be performed by a flexible membrane without a flap.
3. Because these inventions are independent or distinct for the reasons given above and have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Jennifer Zannaco on 1/19/2006 a provisional election was made with traverse to prosecute the invention of the apparatus , claims 1-28. Affirmation of this election must be made by applicant in replying to this Office action. Claims 29 and 30 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

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5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

7. Claims 1-12, 16-18, and 21-28 are rejected under 35 U.S.C. 102(a) as being anticipated by Zuniga et al (US 6,722,965).

Regarding claim 1: Zuniga et al teaches a carrier head 70 for CMP comprising a base (housing 102), a flexible membrane 120 (includes an inner and outer membrane made of elastomer, see col. 5 lines 58-67), the flexible membrane comprises a central portion 180 with a substrate receiving portion, a perimeter portions 184, and a flap 174 extending from the inner surface of the central portion. The flap dividing a volume between the flexible membrane and the base into a plurality of chambers, the flap including a laterally extending first section and an angled second section extending beneath the first section and connecting the laterally extending first section to the central portion horizontally, see Fig. 2

Regarding claim 2: The carrier head of claim 1, wherein the first section extends substantially, see Fig. 2 .

Regarding claim 3: The carrier head of claim 1, wherein the second section has a horizontal loading area sized so as to react out a portion of the downward force on the first section that is created by a pressure in a chamber between the flexible membrane and the base but is not reacted out by the base, see the paragraph joining columns 6 and 7.

Regarding claim 4: The carrier head of claim 1, wherein second section has a horizontal loading area about one-half that of the first section, see Fig. 2.

Regarding claim 5: The carrier head of claim 1, wherein a point of attachment of the second section of the flap to the central portion is substantially vertically aligned with a midpoint of the first section between a point of attachment of the first section to the base and a point of attachment of the first section to the second section, see Fig. 2.

Regarding claim 6: The carrier head of claim 1, wherein the perimeter portion is directly

connected to the base, see Fig. 2.

Regarding claim 7: The carrier head of claim 1, further comprising a retaining ring 110 to surround a substrate on the substrate receiving surface.

Regarding claim 8: The carrier head of claim 7, wherein the first section is sufficiently vertically movable so that a pressure profile applied to a substrate is substantially insensitive to retaining ring wear, col. 6 lines 61-67 teaches a downward load (vertical direction).

Regarding claim 9: The carrier head of claim 1, wherein the flexible membrane includes a plurality of flaps, each flap including a laterally extending first section and an angled second section extending beneath the first section (a plurality of flaps is discussed in col.6 , inner and outer).

Regarding claim 10: The carrier head of claim 9, wherein the flaps are arranged annularly and concentrically, see Fig. 2.

Regarding claim 11: The carrier head of claim 10, wherein the flaps are configured to provide three independently pressurizable chambers, see col. 6 lines 31-47

Regarding claim 12: The carrier head of claim 1, wherein the first section and the second section have about the same thickness, see Figs. 3A-3D.

Regarding claim 16: The carrier head of claim 1, wherein the flap includes a vertical third section between the laterally extending first section and the angled second section, see Fig.5.

Regarding claim 17: The carrier head of claim 16, wherein the flap includes a vertical fourth section between the angled second section and the central portion, see Fig. 5.

Regarding claim 18: The carrier head of claim 1, wherein the flap includes a vertical section between the angled second section and the central portion, see Fig. 5.

Regarding claim 21: The carrier head of claim 1, wherein the plurality of chambers provide independently adjustable pressures to an associated plurality of regions of the substrate receiving surface, and the flexible membrane is configured to provide a substantially uniform transition between different pressures in adjacent regions, see col. 6 and 7.

Regarding claim 22: The carrier head for chemical mechanical polishing of a substrate, comprising: a base; and a flexible membrane extending beneath the base to provide a substrate receiving surface and define a plurality of chambers to provide independently adjustable pressures to an associated plurality of regions of the substrate receiving surface, the flexible membrane configured to provide a substantially uniform transition between different pressures in adjacent regions, see col. 6 and 7.

Regarding claim 23: The carrier head of claim 22, wherein the flexible membrane configured to provide a substantially monotonic transition between different pressures in adjacent regions, see col. 6 and 7.

Regarding claim 24: The carrier head of claim 22., wherein the flexible membrane includes a central portion with an outer surface providing the substrate receiving surface, a perimeter portion connecting the central portion to the base, and at least one flap extending from an inner surface of the central portion, the flap dividing a volume between the flexible membrane and the base into the plurality of chambers, the flap including a laterally extending first section and an angled second section extending

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beneath the first section and connecting the laterally extending first section to the central portion, see col. 6 and 7.

Regarding claim 25: The carrier head of claim 24, wherein the second section has a horizontal loading area sized so as to react out a portion of the downward force on the first section that is created by a pressure in one of the plurality of chambers but is not reacted out by the base, see Fig. 2, 5

Regarding claim 26: The carrier head of claim 25, wherein second section has a horizontal loading area about one-half that of the first section, see Figs 3A-3D.

Regarding claim 27: The carrier head of claim 25, wherein a point of attachment of the second section of the flap to the central portion is substantially vertically aligned with a midpoint of the first section between a point of attachment of the first section to the base and a point of attachment of the first section to the second section, see Figs. 3A-3D.

Regarding claim 28: A flexible membrane for use with a carrier head of a substrate chemical mechanical polishing apparatus, the membrane comprising a central portion with an outer surface providing a substrate receiving surface, a perimeter portion for connecting the central portion to a base of the carrier head; and at least one flap extending from an inner surface of the central portion, the flap including a laterally extending first section and an angled second extending beneath the first section, see Fig. 2

Claims 1-11, 17, 18, 21 and 22 are rejected under 35 U.S.C. 102(a) as being anticipated by Chen (US 2004/0175951).

Chen teaches a carrier head for CMP comprising a base and a flexible membrane with a central portion, a perimeter portion and a plurality of flaps. The flap divides a volume a plurality of chambers. The flap further includes a lateral extending first section and angled section. The first section is horizontal. The section is horizontal sized to react out a portion of the downward force on the first section that is created by the pressure in a chamber between the flexible membrane and the base but is not reacted out of the base. Regarding claim 16: The carrier head of claim 1, wherein the flap includes a vertical third section between the laterally extending first section and the angled second section, see Fig.5.

Regarding claim 17: The carrier head of claim 16, wherein the flap includes a vertical fourth section between the angled second section and the central portion, see Fig. 5.

Regarding claim 18: The carrier head of claim 1, wherein the flap includes a vertical section between the angled second section and the central portion, see Fig. 5.

Regarding claim 21: The carrier head of claim 1, wherein the plurality of chambers provide independently adjustable pressures to an associated plurality of regions of the substrate receiving surface, and the flexible membrane is configured to provide a substantially uniform transition between different pressures in adjacent regions, see col. 6 and 7.

Regarding claim 22: The carrier head for chemical mechanical polishing of a substrate, comprising: a base; and a flexible membrane extending beneath the base to provide a substrate receiving surface and define a plurality of chambers to provide independently adjustable pressures to an associated plurality of regions of the substrate receiving

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surface, the flexible membrane configured to provide a substantially uniform transition between different pressures in adjacent regions, see col. 6 and 7.

Allowable Subject Matter

8. Claims 13-15, 19, and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art fails to teach or suggest a carrier head wherein there is a difference in rigidity between the portions of flexible membrane and a difference in rigidity.

The prior art fails to teach or suggest a carried head as recited in claims 19 and 20 of the claimed invention. Specifically, the prior art fails to teach the flap angles in the carrier head.

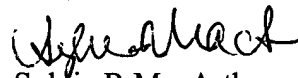
Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438. The examiner can normally be reached on M-F during the hours of 8:30 a.m. and 5 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Sylvia R MacArthur
Patent Examiner
Art Unit 1763

March 6, 2006